drug themselves with them, novelties of the kind will continue to be supplied. But here, again, there is no necessity why one should succumb to the blandishments of the pushful "Kaufmann."

Combines or trusts of the kind we have indicated are looked askance at in this country and America as acting in restraint of competition. But in Germany, where they are known as "cartels," they are positively encouraged and upheld by the courts as a justifiable means of self-preservation. Under the post-war conditions which Germany intends to force upon us, this question needs very careful consideration, and it cannot be solved by economic formulæ which are supposed by doctrinaires to be as fixed and immutable as the law of gravitation.

One noteworthy outcome of the war in Germany has been the establishment by the State of a great institution known as the Central Einkauf Gesellschaft, whereby every importation of raw material into the country falls into the hands of this central buying corporation, which disposes of it under regulations to manufacturers. According to Mr. Gerard, this institution, which was created solely as a war measure, has come to stay. It is defended on the ground that it husbands the gold supply of Germany, prevents useless expenditure abroad, and benefits home industry. The Central Einkauf Gesellschaft will make its own purchases abroad, and as it will be a buyer on an enormous scale it will force the sellers to compete against each other in their anxiety to sell. In this way it is believed that the aggregate purchase will be effected at a lower rate than individual buyers would secure. The material will then be divided among the manufacturers at less eventual cost than if they had purchased it separately abroad. This is an example of socialised buying and selling which, if successful, is bound to have an enormous influence upon German commerce. Its very magnitude may, however render it unworkable in practice. Should it prosper it will give a tremendous impetus to the cause of State Socialism.

Although there is much in Mr. Gerard's account of the manner in which Germany has grappled with the economic difficulties she has brought upon herself, which serves to illustrate her extraordinary powers of organisation and her well-drilled faculty of combination towards a common end, there are many instances of economic blunders on the part of departmental authorities, as, for example, Delbrück's treatment of the cyanide industry and the exportation of potash. In both these cases, and in others that might be mentioned, the anticipated result was altogether falsified by the event, and irreparable injury has probably been done to these industries in Germany. In the attempt to play off the United States against England, Germany was hoist with her own petard.

This fact is beginning to be perceived by the great mass of the commercial community in Germany and Austria-Hungary. Many industries are completely ruined already, and as the war continues to drag along others will share their fate. There are, however, some—powerful organisations like Krupp's and the great body of the Prussian Junkers and the landowners, who as growers of food are making money by the aid of the cheap labour of Russian and other prisoners—which will clamour for the continuance of the war so long as the dumb-driven common herd, who have no real leaders, are inarticulate, and have only a sham political representation, can be induced to tolerate their long-drawn-out agony. To Mr. Gerard it is a matter of surprise that the German manufacturers, who were enriching themselves so rapidly at the expense of the whole world by the aid of low wages and long hours, and with no laws against combination, should have allowed their military autocracy to drive them into war. They would probably have protested, with all the political power they possessed, had they foreseen that they would be up against four-fifths of the civilised world, and that, to use Dr. Helfferich's phrase, they would be doomed to drag about the leaden weight of the billions which this world calamity will have cost the country that really instigated it. No Pyrrhic victories can prevent the social and moral bankruptcy which will assuredly overtake Germany in the long run, and there are signs that this truth is being realised. Germany to-day suffers from the lack of a sane Liberalism, from the want of a strong party of moderate, clear-thinking men with sound political ideals and a larger measure of humanism than characterises the average Prussian. Politically she is torn asunder by two forces—a brutal and unscrupulous autocracy supported by a cunningly devised system of caste, and a Socialism the creed of which, in many of its moral aspects, is repugnant and hateful to all right-thinking men. Germany, like every other nation, has the Government she deserves, and she has brought her deserts upon her own head by her flagrant disregard of the nobler instincts of our common humanity.

T. E. THORPE.

THREE AMERICAN BOOKS FOR GARDENERS.

(1) *Greenhouses: Their Construction and Equipment.* By W. J. Wright. Pp. xvi + 269. (New York: Orange Judd Company; London: Kegan Paul and Co., Ltd., 1917.) Price 1.60 dollars net.

(2) *Vegetable Forcing.* By Ralph L. Watts. Pp. xiv + 431. (New York: Orange Judd Company, 1917.) Price 2 dollars net.

(3) *Modern Propagation of Tree Fruits.* By Prof. B. S. Brown. Pp. xi + 174. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1916.) Price 6*s.* net.

(1) BY the skilful use of glass and artificial heat, gardeners have succeeded in the cultivation of tropical plants in temperate countries. Greenhouse gardening is comparatively modern, for although the Romans, before the time of Christ, knew how to force fruit and vegetables, they applied only hot manure for the purpose, and it was not until the early part of the eighteenth century that glass structures arti-

© 1918 Nature Publishing Group

ficially heated were used for the cultivation of tender plants. Since then, however, the evolution of the greenhouse has been rapid. There are now glass structures, acres in extent, so cleverly made that the cultivation of plants in them is as successful as in the open with the most favourable weather conditions. The market gardeners of England have in the last fifty years made great progress in the art of glasshouse gardening, and in the United States, where the sun affords in winter more heat and light than it does here, huge structures are erected for the forcing of flowers and vegetables.

Mr. Wright, director of the New York State School of Agriculture and formerly a professor of horticulture, has collected in his book a large amount of helpful information concerning the location, adaptation, erection, and equipment of greenhouses to suit American weather conditions and requirements, which both builders and gardeners will be certain to appreciate.

The conditions in England are somewhat different; still, a great deal of Mr. Wright's teaching may be applied in the making of houses, frames, etc., in this country, and in methods of heating them. Our old greenhouses are too heavy and obstruct the light too much. A good plant-house must be strong, yet light, and it must cast very little shade. The angle of the roof, quality of glass, methods of ventilation, and the internal arrangements with respect to benches and floors are all questions of great importance, as Mr. Wright clearly shows in his well-illustrated chapters.

(2) Vegetable forcing as practised in the United States is the subject of an excellent treatise by Mr. Watts, Dean and Director of the School of Agriculture and Experiment Station at Pennsylvania State College. Forcing as practised in horticulture is the application of artificial heat to the growth of plants out of season. It is now very largely resorted to for the production of food vegetables in winter, enormous quantities of fresh, wholesome vegetables being grown in this and other countries where, without it, they would be difficult to obtain. It is also largely practised for the production of certain flowers, especially roses, carnations, daffodils, and violets. Where sunshine in winter is fairly constant successful forcing is easy, as, for instance, in the United States, where there is far more winter sunshine than in England. In greenhouses and frames specially constructed for the purpose perfect crops are produced in midwinter of such vegetables as cabbage, cauliflower, lettuce, radish, tomato, cucumber, rhubarb, asparagus, French bean, and mushroom. A knowledge of the treatment of soils, suitable manures, right temperatures and ventilation is necessary, and is best obtained by actual experience. Useful guidance can also be obtained from books, such as that by Mr. Watts, which sets forth the best methods of the American practitioners. They believe in soil sterilisation by means of steam or formalin. It is found that the soil continues to be productive year after year when it is annually sterilised, whereas without this it becomes "sick" and infested with fungi and other causes of disease in plants. Stable manure is preferred to all other fertilisers, but nitrate of soda is sometimes used as a growth stimulator. Greenhouse construction, heating, insect enemies and diseases, and marketing are carefully treated. The statement that plants are rendered susceptible to disease by high temperatures, excess of water, and over-manuring will be endorsed by practical cultivators in this country.

(3) The propagation of fruit trees by means of grafting, budding, layering, and cuttings is essentially the same in all countries. The methods vary, as does the skill with which the operations are performed. In America, where fruit-growing is done on a very large scale, labour-saving methods are practised. Orchards miles in area have to be planted and worked, for which men with spades and pruning-knives would be as inadequate as they would be for agriculture. The alert Americans have therefore sought the assistance of the machine-maker for their digging and planting operations, and even for binding in the operation of grafting.

Prof. Brown's book enables us to realise what a big industry fruit-growing has become in America. There are nurserymen there who each dispose of young trees by the million annually. "The growing of all the twenty to forty millions of American-grown apple seedlings that are used in this country every year is undertaken by less than a dozen firms." In addition, large quantities of young trees, both stocks and "maidens," are imported from Europe. At this rate America will soon be covered with fruit trees unless they are used up quickly, as roses are in that country. Some of our own fruit authorities advocate this intensive system on the ground that young trees properly managed give their best in the first few years, after which they should be scrapped. Apples, pears, plums, cherries, peaches, and a few other fruits are invariably grafted or budded on stocks known to influence growth and fruitfulness. Too little care, however, is exercised in the selection of stocks. Prof. Brown discusses the influence of scion on stock in regard to commercial fruit trees. His book is written for students, a number of what he calls "review questions" being set out at the end of each chapter, such as "What is meant by influence of stock over scion?" It contains numerous helpful illustrations.

W. W.

ANALYTICAL DYNAMICS.

A Treatise on the Analytical Dynamics of Particles and Rigid Bodies: with an introduction to the Problem of Three Bodies. By Prof. E. T. Whittaker. Second edition. Pp. xii+432. (Cambridge: At the University Press, 1917.) Price 15*s.* net.

THE first edition of this book was reviewed in NATURE of April 27, 1905. At that time what we now call aeroplanes only existed in

© 1918 Nature Publishing Group